

CLAIMS

What is claimed is:

1. A method for a DHCP client to send a DHCP request to a DHCP server via a BOOTP Relay Agent, the DHCP client contained in a Mobile Host having a MAC address and having MAC layer connectivity with a foreign agent having a MAC address and a care of IP address, the BOOTP Relay Agent being coupled to a home agent having an address, the steps comprising:

A) sending a mobile IP Registration Request message and a Mobile IP Registration Reply message to establish a Mobile IP forward tunnel and a Mobile IP reverse tunnel, the Mobile IP Registration Request having a Mobile Host Identifier that is set to the MAC address of the Mobile Host, and the Mobile IP Registration Reply message having a Mobile Host Identifier that is set to the address of the Mobile Host, wherein the MAC address of the Mobile Host is used to identify mobility bindings for the Mobile Host;

B) generating a DHCP request, the DHCP request having a protocol field, the protocol field containing the MAC address of the Mobile Host;

C) sending the DHCP request to the foreign agent;

D) adding an encapsulation header by the foreign agent;

E) sending the request to the home agent;

F) removing the encapsulation header; and

G) forwarding the request to a home subnet.

2. The method of claim 1, further comprising:

H) generating a DHCP reply, the DHCP reply having a protocol field, the protocol field containing the MAC address of the Mobile Host;

I) sending the DHCP reply across the home subnet to the home agent;

J) adding an encapsulation header to the reply by the home agent;

K) forwarding the reply to the foreign agent;

L) removing the encapsulation header by the foreign agent; and

M) forwarding the reply to the mobile host.

3. The method of claim 2, wherein the encapsulation header added to the DHCP request is an IP encapsulation header having a source field containing the IP address of the foreign agent and a destination field containing the IP address of the home agent.

4. The method of claim 3, wherein the encapsulation header added to the DHCP reply is an IP encapsulation header having a source field containing the IP address of the home agent and a destination field containing the IP address of the foreign agent.

5. A method for a DHCP client to send a DHCP request to a DHCP server via a BOOTP Relay Agent, the DHCP client contained in a Mobile Host having a MAC address and having MAC layer connectivity with a foreign agent having a MAC address and a care of IP address, the BOOTP Relay Agent being coupled to a Home Agent having an address, the steps comprising:

A) establishing a Mobile IP reverse tunnel by sending a Mobile Host Registration request with a Mobile Host Identifier that is set to the MAC address of the Mobile Host, wherein the MAC address of the Mobile Host is used to identify mobility bindings for the Mobile Host;

B) establishing a Mobile IP forward tunnel by sending a Mobile Host Registration Reply request with a Mobile Host Identifier that is set to the MAC address of the Mobile Host, wherein the MAC address of the Mobile Host is used to identify mobility bindings for the Mobile Host;

C) generating a DHCP request, the DHCP request having a giaddr field and a protocol field;

D) setting the giaddr field to 0 and the protocol field to the MAC address of the Mobile Host;

E) adding an inner encapsulation IP header and an outer encapsulation IP header to the DHCP request, the inner IP encapsulation header having a source IP address and a destination IP address;

F) setting the inner IP encapsulation header source address to indicate that the source station does not have an IP address; and

G) sending the DHCP request to the MAC address of the foreign agent;

H) examining the inner IP encapsulation header source IP address;

I) adding an outer IP encapsulation header, the outer IP encapsulation header having a source address and a destination address;

J) setting the outer IP encapsulation header source address to the foreign agent IP address and the outer IP encapsulation header destination address to the home agent IP address;

K) forwarding the request to the home agent.

L) removing the outer IP encapsulation header;

M) examining the inner IP encapsulation header source address; and

N) removing the inner IP encapsulation header; and

O) forwarding the request to a BOOTP relay agent coupled to the home agent

P) obtaining the MAC address of the mobile host from the chaddr field in the BOOTP header;

Q) inserting the BOOTP relay agent IP address into the giaddr field of the BOOTP header; and

R) forwarding the DHCP request to the DHCP server.

6. A method for sending a DHCP reply from a DHCP server to a DHCP client located on a foreign subnet having a foreign agent having a foreign agent care of IP address, via a BOOTP Relay Agent coupled to a home agent on a home subnet, wherein the DHCP server having received a request from the DHCP client, the request having a giaddr address set to the address of the BOOTP Relay Agent, comprising the following steps in the sequence set forth:

A) generating a reply, the reply being addressed to the giaddr address;

B) sending the request to a BOOTP relay entity coupled to the home agent on the home subnet

C) obtaining a MAC address of a mobile host that contains the DHCP client from

the chaddr address in a BOOTP header; and

D) adding a destination IP address; and

E) adding an inner IP encapsulation header, the inner IP encapsulation header
5 having a source address and a destination address, the inner IP encapsulation header source
address being set to the home agent address, the inner IP encapsulation header destination
address being set to zero; and

F) sending the reply to the home agent.

10 7. The method of claim 6, further comprising:

G) removing the inner IP encapsulation header; and

H) forwarding the request to the DHCP client.

15 8. The method of step 7, wherein step E) further comprises adding an outer IP
encapsulation header having a source address and a destination address, the source address of
the outer encapsulation header being set to an IP address of the home agent and the destination
address of the outer encapsulation header being set to the care of IP address of the foreign
agent; and step G) further comprises removing the outer encapsulation header.

20 9. A method for a DHCP client for obtaining an IP address from a DHCP server,
the DHCP client being connected to a foreign subnet having a foreign agent, the foreign agent
having a care of address, a home subnet having a home agent, the home agent having an
address, comprising the following steps in the sequence set forth:

25 A) sending a mobile registration request having a MAC address as a mobile host
identifier;

B) generating a DHCP request by the client, the DHCP request having a protocol
field, the protocol field being set to the MAC address of the mobile host;

C) adding a first inner IP encapsulation header and a first outer IP encapsulation
header to the DHCP request;

30 D) sending the DHCP request to the home subnet;

- E) removing the first inner IP encapsulation header and first outer IP encapsulation header from the DHCP request;
- F) forwarding the request to the DHCP server;
- G) generating a reply to the DHCP request;
- 5 H) adding a second inner IP encapsulation and a second outer IP encapsulation header to the reply;
- I) sending the reply to the foreign subnet;
- J) removing the second outer encapsulation header and the second inner encapsulation header; and
- 10 K) forwarding the reply to the DHCP client.

10. The method of claim 9 wherein the DHCP request includes a giaddr field, the first inner IP encapsulation header having a source address and a destination address, step A) further comprising:

- 15 1) setting the giaddr field to 0;
- 2) setting the first inner IP encapsulation header destination IP address to indicate that the DHCP client does not have an IP address.

11. The method of claim 9 wherein the first outer IP encapsulation header has a source address and a destination address, the steps further comprises setting the first outer IP encapsulation header source address to the foreign agent care of address and the first outer IP encapsulation header destination address to the home agent address.

12. The method of claim 9 wherein step D) is performed by reverse Mobile IP tunnel.

13. The method of claim 9 wherein the DHCP request having a giaddr field and a chaddr field, step E) further comprising:

- 1) obtaining the MAC address of the DHCP client from the chaddr field; and

2) inserting the BOOTP relay agent IP address into the giaddr field.

14. The method of claim 9, the second inner IP encapsulation header having a source IP address and a destination IP address, step H) further comprising setting the second inner IP encapsulation header destination IP address to indicate that the source mobile host does not have an IP address.

15. The method of claim 9, the second outer IP encapsulation header having a source IP address and a destination IP address, step H) further comprising setting the second outer IP encapsulation header source address to the home agent IP address, and setting the second outer IP encapsulation header destination IP address to the foreign agent care of IP address.

16. The method of claim 9, the reply having a chaddr field, step K) further comprising:

- 1) obtaining a MAC address for a mobile host coupled to the DHCP client from the chaddr field; and
- 2) forwarding the reply to the mobile host identified by the MAC address.

17. A mobile host, the mobile host containing a DHCP client, the mobile host being on a foreign subnet communicatively coupled to a home subnet of the DHCP client, comprising:

means for sending a mobile IP registration request with a mobile host identifier, the mobile host identifier set to the MAC address of the mobile host;

means for receiving a reply to the mobile IP registration request having a mobile host identifier, the mobile host identifier being set to the MAC address of the mobile host.

means for receiving a DHCP request, the request having a giaddr field and a protocol field;

means for setting the giaddr field to 0 and the protocol field to the MAC address of the mobile host;

means for adding an inner encapsulation IP header to the DHCP request, the inner encapsulation header having a source address and a destination address;

means for setting the source IP address to indicate that the mobile host does not have an IP address; and

means for sending the request from the foreign subnet to the home subnet.

18. The mobile host of claim 17 wherein the source IP address is set to zero.

19. A mobile host, the mobile host containing a DHCP client, the mobile host being on a foreign subnet communicatively coupled to a home subnet of the DHCP client, comprising:

means for sending a mobile IP registration request with a mobile host identifier, the mobile host identifier set to the MAC address of the mobile host;

means for receiving a reply to the mobile IP registration request having a mobile host identifier, the mobile host identifier being set to the MAC address of the mobile host.

means for receiving a DHCP request, the request having a giaddr field and a protocol field;

means for setting the giaddr field to 0 and the protocol field to the MAC address of the mobile host;

means for setting the source IP address to indicate that the mobile host does not have an IP address; and

means for sending the request from the foreign subnet to the home subnet, wherein the means for sending the request sends the request to a proxy entity connected to an access point, the proxy entity having means to forward the request to a foreign agent such that the request is forwarded only to the home subnet.

20. Computer readable medium of instructions, comprising:

means for sending a mobile IP registration request with a mobile host identifier, the mobile host identifier set to a MAC address of the mobile host;

means for generating a DHCP request, the request having a giaddr field and a protocol field;

means for setting the giaddr field to 0 and the protocol field to the MAC address of the mobile host;

5 means for adding an inner encapsulation IP header to the DHCP request, the inner encapsulation header having a source address and a destination address;

means for setting the source IP address to indicate that the mobile host does not have an IP address; and

means for sending the request.